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Some Causes of Unevenness in Printing with Naphtol AS Colors

By T. C. HUTCHINS

THE direct printing of naphtols may be carried out in two ways. (I) By impregnating the cloth with the requisite naphtol solutions and printing thickened solutions of the fast color salts or diazotized bases on the impregnated and dried material. (II) By printing thickened naphtol solutions on unprepared material and developing afterwards in fast color salt or diazotized base solutions. The appended notes, however, will refer to the first mentioned process which is in common use in most print works.

IMPREGNATION OF GOODS

In the first stage, i.e., impregnation—this is carried out in exactly the same manner as for dyeing, on a three-bowl mangle. It is important in the first instance to ensure a perfect and even saturation of the cloth by the naphtol solution and to this end, the mangle bowls should be in as perfect condition as possible. The apparatus regulating the pressure should also be of such a type that pressure is exerted evenly over the whole surface of the bowls and not in one part more than another. For instance, if the mangle is of swing weight type with levers on either side the chances are that the sides will show a difference in pressure, which will be reflected when the goods are printed, by one side giving a darker shade than the other. The best type of mangle, therefore, for even impregnation is that with central adjustment of the pressure on the wooden or top bowl.

Another type of mangle bowl to avoid is one that is worn. All wooden bowls tend to become more worn in certain spots and as this wear progresses the danger of unevenness increases. This danger is not, however, so great in the case of prints as in padding, where unevenness in shade is much more liable to be revealed, especially in the lighter shades.

DRYING OF IMPREGNATED GOODS

Even after the goods have been thoroughly and satisfactorily impregnated it is possible for unevenness to arise by reason of faulty drying. In drying of naphtol prepared goods in the days when β naphtol was the only naphtol in use, great care had to be taken in order to prevent browning or decomposition of the prepare. This was usually prevented by the addition of a proportion of alkaline antimony oxide solution to the prepare as a protecting agent and also by drying the goods at as low a temperature as possible. In drying by copper cylinders the usual practice was to use sectional drying or failing this the wrapping of one or two of the first cylinders with clean grey cloth.

In sectional drying the first half dozen cylinders are kept at a lower temperature than the others by means of a separate steam connection.

In opposition to this theory the Naphtol AS solutions should be dried as quickly as possible by means of a hot flue wherever possible. A temperature of 175° F. being usual. The danger of drying at too low a temperature is that there is a tendency for the damp naphtol solution to split by hydrolysis and if this happens the prints will turn out weaker than expected.

It is also for this reason that drying should take place uniformly, i.e., there should not be any tendency on the part of the drying machine to dry one side of the piece more than the other. In the case of a hot flue a sufficient circulation of hot air should be maintained in all parts of the apparatus, which should also be allowed to get well heated before any attempt is made to pass the goods through it. In the case of a range of drying cylinders the goods should preferably be dried after some other goods, which will ensure the cylinders being well and uniformly heated before drying of the naphtol is commenced at all.

One way in which this unevenness will show will be in heavy blotch prints, these will be darker on one side of the piece than the other. The darker side will have been thoroughly and quickly dried while the other side by reason of faulty circulation of hot air in the hot flue or of steam in the case of drying cylinders will be lighter in consequence of the hydrolysis of the naphtol solution referred to.

In drying with cylinders it is not necessary nor advisable to heat them too strongly. The ideal to aim at, is to have the cylinders sufficiently and uniformly warm to begin with in order to dry the impregnated goods thoroughly without roasting them. In a range of up to 20 cylinders this object should be attained by keeping the steam at a pressure of 12-15 pounds per square inch. The squeezing effect of the mangle for this purpose should be approximately 100 per cent. Another point of importance in cylinder drying is to have the goods touching the cylinders with alternate sides so that back and face of the goods are both dried uniformly and speedily. If the goods are threaded in such a manner as to have one side of the piece dried sooner than the other then the consequence will be a double sided pad in the case of pad dyeings.

Again, the goods may be dried on a pin-tenter frame. Spring-clip tenters are not suitable as the hot metal of the clip destroys the naphtol at those portions where the cloth is gripped. In drying the goods on a tenter frame of this type the hot air should be blown on both top and bottom of the material as it passes through. If the air ducts are situated beneath the cloth only, then the result will be a two-sided dye or print as previously mentioned. Prints are not, of course, affected to the same extent as pads in such a case, except in those instances where duplex prints are the rule.

After drying the goods should be batched up for printing and not left to lie about loosely piled. Goods in this latter state are more liable to be attacked and the naphtol more or less decomposed by the adverse influences of light, air, acid vapors, etc.

The goods should also be printed soon after impregnation as it is a well known fact that goods left lying too long will not give as good whites in the unprinted portions as those which have been printed soon after naphtolating. On the other hand, it is quite safe to leave naphtolated goods overnight before printing, the precaution only applies where there is any danger of the prints having to lie for 2 days or more before printing.

PREPARING THE PRINTING COLOR

The print color may be prepared in two ways:

1. By making a thickened solution of the diazotized color base.
2. By thickening a solution of the color salt.

As the former method is more involved and is not so satisfactory, method 2 is usually adhered to by all practical men.

All that is necessary in this case is to dissolve the requisite quantity of the stabilized color salt in water and add it to the prepared thickening. These salts are, as a rule, so soluble that there is no difficulty whatever attached to their application. In some cases an addition of acetic acid to the aqueous solution is advisable for the following reasons:

1. In the cases advised by the makers the brilliancy of the prints is noticeably increased especially in the instance of yellow shades which come up much cleaner.
2. With one salt at least, Fast Black Salt K, an addition of acetic acid is absolutely necessary, as otherwise a full black cannot be produced.
3. It is necessary in printing two-tone effects, in consequence of the fact that the naphtol impregnation which is strongly alkaline has to do duty for both print colors. In the case of the light tones the acid in the print color neutralizes the excess of alkali in the prepare and so is a direct aid in the production of uniformity in these pale shades which would be very apt to develop unevenly in the absence of acetic acid.

When preparing thickened solutions of diazotized bases it should be remembered that very dilute solutions are easily decomposed and couple very slowly. For this reason it is best to keep such pale tones rather full, to allow for this tendency.

In the matter of thickenings it is generally recognized that starch-tragacanth is the best medium for all purposes. Gums of all classes yield poorer prints and unstable print colors, and dextrin in any form must be avoided because of its adverse influence upon the color salts of diazotized bases.

There is one other, though it must be admitted, rather remote danger, in preparing very dark print pastes of good viscosity. In dissolving the color salt in such a case, the amount of water naturally has to be cut down to a minimum in order to preserve the thickness of the print paste. In such instances great care should be taken to see that the salt is thoroughly dissolved before adding it to the thickening. If solution has not taken place properly then coupling will be poor and on the surface of the material, so that a good proportion of the color lake is not fixed on the fiber at all and washes away in the wet processing. Poor and thin colors are the result to say nothing of inferior whites which are stained by the surplus color coming off in the washing-off becks. Such whites can only be restored to their original purity by drastic means, e.g., clearing in hypochlorite solutions, etc., which have at the same time an adverse effect on the already weakened print color.

THE PRINTING PROCESS

Printing is usually carried out by roller and there are several points here which need close attention if perfect prints are to be produced:

1. Sufficient time must be allowed between the actual contact of the two components—naphtol and thickened color salt—to bring about perfect coupling. For this reason a fairly long air passage is necessary before the goods come on to the drying cylinders or into the hot flue. Drying too quickly arrests development and leads to inferior colors and surface coupling with its attendant evils.
2. In light patterns especially, care should be taken to see that the print color is kept continually fresh-

ened and that when making additions of color, it is not added in one particular place but spread over the roller, as much as possible. In long runs of prints it is possible to show differences of shade by adding color in one place all the time and allowing the print paste at the other side of the color box to go stale and more or less decompose, by the adverse influences of heat, adulteration with naphtol, etc.

For the same reason a print color should not be allowed to work too long in a light print pattern but if necessary the box should be emptied periodically and filled up with fresh printing paste.

Drying should also proceed in a similar manner to that already described for naphtolating so as to avoid irregularities in development.

FINAL TREATMENT OF THE PRINTS

All that remains to be done after printing and drying of the goods is to wash them off carefully. Provided the prints are protected from moisture, light and acid vapors they need not necessarily be washed off immediately, but may remain overnight or for two or three days.

The washing treatment is carried out as follows: The goods are passed open width through a hot soda ash solution then rinsed in hot water and finally soaped well at the boil. In this latter connection the use of fatty alcohol sulfonates is advised as giving better removal of surplus color-lake and consequently increasing the fastness to rubbing of the finished goods.

Lastly in printing all naphtols, an important point to keep in mind is the sampling of each color or combination of colors before proceeding to print, in order to make sure that the impregnation has been properly carried out.

● GENERAL RELEASES

The General Dyestuff Corporation announces release of circulars on the following products. Copies of these bulletins may be obtained on request.

Brilliant Indocyanine 7BF—a new acid blue, brought out by the I.G. It is brighter in shade and superior in level dyeing to the Brilliant Indocyanine brands 6B and G. It is said to be of special interest to the knitting trade because of good fastness to washing, water, salt-water and perspiration. The fastness to light is only moderate but, it is claimed, represents the best which may be obtained in such a bright blue. It is said to have good affinity for pure and tin-weighted silk and to dye wool-silk mixtures a uniform shade. It is further claimed that this dyestuff exhausts well from a neutral bath and is recommended by the manufacturers for brightening the wool in union dyeing.

Celliton Discharge Dyestuffs—a sample card showing 14 acetate silk colors discharged to a white with Decroline Soluble Conc. and illustrates a number of valuable combinations of browns, navies, blacks and greens obtained with the use of Celliton Discharge Blue 3R, said to be the only dischargeable acetate direct blue placed on the market so far.

Celliton and Celliton Fast Dyestuffs—a sample card showing 37 of these colors printed on acetate silk. Formulae and fastness properties for each are given.

Palatine Fast Claret BN—a new dyestuff supplementing the range of red Palatine Fast brands. It is equally as clear as and slightly bluer in shade than the old RN brand and is said to leave vegetable effects much whiter. It is said to level well and to possess very good fastness to light, and good fastness to washing, milling, sea-water, perspiration, rubbing, alkali, decatizing and carbonizing. It is further claimed that this dyestuff exhausts the bath very well and discharges well.

Prestabit Oil V—a textile auxiliary said to be of particularly good resistance to organic and inorganic acids, Epsom salt and lime salts. It is also said to have excellent wetting-out and penetrating properties. It is claimed that the use of this product will result in a saving of time and steam and will also lead to an improved quality of goods.

Eulan N—a chemical which, it is claimed, has proven in production that it is one of the safest and most durable of mothproofers on all kinds of woolen goods. Methods of application are given.

Celliton Fast Brown 5R—a new homogeneous brown for acetate silk said to be fast to light, washing, acid and alkali. It is further said to level very well and to discharge to a clear white.

Diazo Fast Yellow 2GA—a new color manufactured by the General Aniline Works which, when dyed in the usual way from a salt or Glauber's salt bath and then diazotized and developed with Developer ZA is said to produce on cotton and other vegetable fibers bright greenish yellows of good fastness to light and ironing and very good fastness to washing, rubbing, alkali and acid. It is said to discharge to a very good white with Rongalite C.

● USE OF NICKEL

With industry turning more and more towards iron-free chemicals in the production of a variety of products a substantial increase in the use of equipment made of nickel and nickel alloys is reported from many sections of the chemical field according to the annual sales summary of the International Nickel Company.

"Producers of caustic soda and of phenol, both of which are especially susceptible to contamination by most metals, were among the most important users of nickel and nickel-clad steel during 1934," the summary reports.

"Increasing demands also came from producers of alum, especially for paper making, another field in which protection against iron contamination is essential. One of the largest manufacturers in this field employs Monel metal for crystallizers, agitators, conveyors, chutes and centrifuges. Another has found nickel-clad steel particularly satisfactory for floor moulds on which blocks of alum are cast."

● CARBIC RELEASES

The Carbic Color & Chemical Co., Inc., announces release of bulletins on the following new products. Copies of these circulars may be obtained on request.

Chrome Luxine Yellow 5*G*—a new chrome printing color which is distinguished by its greenish yellow shade of a brightness which, it is said, has not been known up to the present among mordant dyestuffs. Its fastness to light is said to be remarkable, fastness to soap is said to be slightly inferior to Chromocitronine R, fastness to washing is said to be very good and to chemic good. It is claimed that this product withstands hydrosulfite very well. The bulletin gives further properties of this dyestuff, methods of application and samples.

Novochrome Fast Yellow 5*R*—a new chrome printing color which is also distinguished by its brightness which in this case is a golden yellow. It is said to be dischargeable to white with hydrosulfite. It is also said to possess a good to very good fastness to light, very good fastness to soap and very good fastness to chemic. It is said to be of special interest for printing cotton. Methods of application and samples are given.

Reserve X—a new powder which allows the reserve, either white or colored, of those Indigosol brands which have been difficult or impossible to reserve. It is said that it gives impeccable white or colored reserves under Variamine Blue and Aniline Black. This product acts as a thickener and a reserve at the same time thus simplifying the preparation of the printing colors. For Indigosols, Reserve X is used with the addition of soda ash and zinc white; for Aniline Black, a little soda ash is added besides the water; for Variamine Blue the soda ash is replaced by ammonium sulfocyanide. Methods of using this product are described.

● QUARTERLY PRICE LIST

Copies are now available of the Quarterly Price List of the R & H Chemicals Dept. of E. I. du Pont de Nemours & Co. A new product listed is Beta-Trichlorethane which is a new, non-inflammable solvent with a boiling point of 114° C. It is said to be an excellent solvent for many organic materials, including oils, fats, waxes, tars, rubbers, etc.

● FIFTIETH ANNIVERSARY

The Fiftieth Anniversary of the Drysalters Club of New England was celebrated on Monday, January 28th, with a banquet at the Hotel Copley Plaza in Boston, Massachusetts. The Drysalters Club was formed on March 11th, 1885, "to promote the welfare of its members and to strengthen fraternal and social relations among one another." Joseph A. Bryant of Arnold-Hoffmann was toastmaster. Among the speakers were James M. Curley, Governor of Massachusetts; Bill Cunningham, sports writer of the Boston "Post"; Charles L. Gagnebin, Club Historian, and Eliot Wadsworth, President of the Boston Chamber of Commerce. The present officers of this club are as follows: Walter H. Zillessen, president; Alvah H. Pierce, vice-president, and Frank W. Benvie, secretary-treasurer.

● ELECTED CHAIRMAN

At the annual meetings of the stockholders and directors of Arthur D. Little, Inc., chemists and engineers, Cambridge, Mass., held respectively on January 23 and 24, Arthur D. Little retired as president and was elected chairman of the board. Earl P. Stevenson, who has been with the organization since 1919 and vice-president since 1922, was elected president, and Roger C. Griffin, a member of the staff since 1909, was elected treasurer. Raymond Stevens continues as vice-president.

● VAT DYES

The demand for vat dyes during the past year showed a very definite increase, especially for use in cotton goods, according to the Dyestuffs Division of the Organic Chemicals Department of E. I. du Pont de Nemours & Co., Wilmington, Del. This increase has carried over into 1935, with prospects that the first six months of this year will show a continuation of the upward trend. The greater demand is attributed, in part, at least, to improvement in the economic situation and a growing desire for fast colors on the part of the consumer.

The steady decline in the demand for vat dyes, which set in late in 1929 and continued throughout the so-called depression years, took a turn for the better during 1933, the peak being reached along about July of that year with buying immediately preceding the going into effect of the textile code. Following the July spurt in increased business, there was a gradual dropping off up to December of that year, when a comparatively low point in buying was again reached.

Soon after the New Year, 1934, there was evidenced a decided turn for the better. The demand slowly gained momentum, showing a favorable increase for 1934, and has continued up to the present. Incidentally, prices are somewhat down and are in closer competition with the more fugitive dye prices.

As is well known, there are at present approximately 2,000 separate and distinct dyestuffs made and sold commercially with known shades and varying degrees of fastness. Of this number, the range of vat colors, both for dyeing and printing, has had several patented additions made to it during the past few years, thereby offering a much larger variety from which selections to meet special conditions may be made.

● MATHIESON MOVES

The Mathieson Alkali Works have moved their offices from 250 Park Avenue to the Lincoln Building at 60 East 42nd Street, New York City.

PROCEEDINGS OF THE
American Association of Textile Chemists and Colorists

FEBRUARY 11, 1935

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Members should notify the **Secretary** immediately of all address changes

SATURDAY MORNING SESSION

(Continued from last issue)

Mr. A. R. Thompson, Jr.: Mr. Chairman and Fellow-Salesmen (laughter): I want to pause a moment so I can look around and see if my bosses are in the room. I say, "Fellow-Salesmen," because you may not realize that you are salesmen, and some of you are not but you ought to be. You ought to be able to sell yourself to your boss and to the firm that you work for.

In that respect we are all on common ground and we are all salesmen regardless of what field we may be engaged in.

I want to start by reading a definition of a salesman as written by Elbert Hubbard. It seems that Elbert went out to sell some of his works. Before he left he got clear in his mind the real definition of a salesman and this is what he had in mind:

"The typical salesman is a young man in good flesh, well-dressed, and has an air of prosperity. His face is ruddy, his eyes bright, but there is no sign of intelligence. (Laughter.) He is bubbling over with enthusiasm for what he has to sell, can say ten words where one would do, but has no sense of time or the value of it, and is without terminal faculties. Unfortunately, they propagate like rabbits (laughter) and overproduction is affecting their value. If a salesman could be bought for the appraised value placed on him by a committee of buyers and sold for what the salesman himself thinks he is worth it would be a most profitable transaction." (Laughter.)

Then he came back, after seeing the publisher, and this is the definition he wrote of a purchasing agent:

"The typical buyer is a man past middle age, spare, wrinkled, intelligent, cold, passive, non-commital, with eyes like a codfish (laughter), polite in contact, but at the same time unresponsive, cool, calm, and damnable, composed as a concrete post or a plaster of paris cast, a human petrification with a heart of feldspar and without charm or the friendly germ, minus bowels, passions, or the sense of humor. Happily, they never reproduce and all of them finally go to Hell." (Laughter and applause.)

. . . Mr. Thompson then presented his prepared paper . . .

Proceedings of the American Association of Textile Chemists and Colorists

Salesmanship—Merchandising*

By A. R. THOMPSON†

INTRODUCTION

THE Garden of Eden was the scene of the first purchasing office of which we have any record. Adam knew that he had the only woman in the world, and a very low overhead, but never considered that there was any necessity for advertising, nor dreamed that there was such a thing as a salesman anywhere around. The salesman showed up, however, and called on Eve with the first and most wonderful selling talk that has ever been conceived about an apple; history tells us that Eve fell for the sales talk, and on that day advertising and salesmanship had its origin. It is commonly thought among some travelers that this first salesman was the cause of certain modern purchasing agents thinking that all salesmen are little more than serpents. With this very brief history of the origin of salesmanship, we will pass on to the more modern and acceptable study of an occupation in which everyone is engaged, in one form or another.

NEED FOR MORE SCIENTIFIC MERCHANDISING

I will use the word merchandising instead of selling in most cases to include the buying as well as the selling part of each transaction; for no sale can be complete without both a buyer and a seller.

There is unquestionably a far greater necessity for sound merchandising today than there was 25-30 years ago, due to the fact that competition is infinitely keener. Therefore, we cannot afford hit or miss methods and loose thinking, if we expect to stay in business and compete on a profitable basis in such highly competitive markets at home and abroad.

It may startle some to learn that approximately fifty cents out of every dollar of gross receipts in industry goes to the purchasing of materials alone, the remainder is charged to wages at twenty cents and interest, taxes, overhead and profit at thirty cents, according to a report of the United States Census Bureau. It is this expenditure of fifty cents on which our attention should be concentrated for the present.

Management has certainly lagged in its appreciation of the importance of applying to the purchasing of its raw materials the scientific principles that have revolutionized production, and it naturally follows that the same holds true for the selling of the products of each industry. From this standpoint, it may well be asserted that scientific merchandising is in the same nebulous state which characterized scientific production ten to twenty years ago.

Every engineer and plant man is familiar with the rapid progress that has been made in improving industrial efficiency in recent years; it seemed that it had to be done, and the proper minds were concentrated on the subject with amazing savings, hitherto thought impossible, as the result.

The merchandising end of our business needs to go through the same searching investigation and correction that the engineers found necessary to effect our industrial plant savings, and concentrate on this important function of industry until a satisfactory plan is worked out. It will not be enough for us simply to concentrate on this problem, we must do something constructive about it, after we have found out what is wrong. There are certain principles that underly scientific distribution and merchandising just as we know exist in the field of scientific plant production. The chief difference in the two fields of endeavor is that the leaders in the production problems are not only aware of the causes of trouble and wastes, but they act on the principle involved and remove the cause of the inefficiencies, whereas our merchandising leaders seem quite unaware that the same scientific principles can be utilized in the merchandising of their products to effect a corresponding saving in the cost of distribution. It is not my intention even to outline a plan for carrying out this task, within the scope of this treatise, but I hope that you will find it more interesting to study the great possibilities that are to be found in a careful and exhaustive investigation of scientific merchandising plans.

BUSINESS TRAINING FOR STUDENTS IN TECHNICAL SCHOOLS

I particularly hope that the educational leaders in our technical institutions will give some attention to this side of the training of the students that come under their care and instruction. It seems a pity that a student be allowed to spend four or five years in college, learning

*Presented at Annual Meeting, December 8th, 1934.
†Ciba Company, Inc.

the fundamentals and a few fancy ideas about the life work which he intends to follow, and then leave college with hardly the slightest idea of what he is going to do with all his training, that is to say, not knowing anything of the fundamental principles involved in selling his services to his first employer, not to mention the more complicated task of later selling his ideas or products of one kind or another to an unsympathetic world. In most technical institutions, it is commonly considered sufficient that a student be given a thorough course in the technical subjects he has chosen to major in; but life is full of pathetic cases where very capable students in college have wasted their education in later years and finally drifted into oblivion, solely because they did not know how to sell themselves to someone who could use their services.

The most successful athletes will train for months for a fight or a race that may last only a few minutes; but so few of us are willing to spend a little extra time in preparation for the battle of life that lasts for years, that it is but little wonder that we see so many human and business wrecks that were unable to get started, or that could not keep the pace, simply for the lack of training.

WHAT ARE WE PAID FOR?

In the long run we are all paid according to what we sell, whether we are professors in college selling information to the students, political leaders selling a certain constituency on the wisdom of our ideas about the right and wrong way to deal the cards so that everyone will have a good hand in the New Deal; or the president of a great corporation trying to sell the board of directors on a new plan of manufacturing or merchandising which requires more money; or we may be the manager or superintendent of some textile plant, trying to please some merchant in a far off city; or maybe we are a research chemist struggling along in the laboratory, trying to prove to our employers that this expenditure, or that change in the scheme of investigation will be profitable; or we may be the dyer or finisher in some plant that has just been notified that the last ten cases of goods were not the same shade or finish as the guide, and will have to be refinished; or possibly we are engaged to buy the raw materials and countless other items that are required for the operation of a manufacturing plant or mercantile establishment; and last but not least, we might be a dyestuff or chemical salesman trying to make it easier for the purchasing agent to buy the necessary materials for his firm at the lowest possible cost, and with the greatest amount of satisfaction. (I hope no one has been overlooked.)

Let us assume then, that we are all thinking of the problem of making a living by means of selling, from the same point of view, and pass on to a study of the relationship existing between production and distribution, and the underlying reasons why we buy certain services, products, or ideas that are presented to us in exchange for our money or other valuable considerations, and why certain other products, etc., are not considered.

RELATION OF PRODUCTION TO DISTRIBUTION

We will consider this important relationship briefly and try to illustrate the close connection with a few well chosen examples. There is a definite relationship between production and distribution. If the demand for a certain article stops or is greatly curtailed, it would be suicidal to continue to manufacture this article and try to merchandise it. It would seem that after the experience gained during the past few years, no modern factory would devote its time and money to such an undertaking for any protracted period. Therefore, the demand for a certain service or commodity is directly related to the amount it is wise to produce, and to the ease with which it is marketed.

There must be something more than demand, however. You may recall the famine in China about 1930. Notwithstanding the fact that China raised a surplus of rice that year, millions of men, women and children died from starvation, because they could not get any of this rice to keep them alive. These millions of people died, not because the Chinese Government did not care about the conditions existing in the inland parts, nor because the Chinese farmers ignored the plight of their countrymen. The Chinese were up against a factor which we are considering right now, namely, the important problem of distribution. There were no adequate means of getting this surplus rice to the famine areas, no railroads or other suitable modes of transportation; the only way that the rice could be delivered, was by the hopelessly slow method of loading it on the backs of coolies, and before a coolie could get to the distressed areas, he would have eaten all the rice he could carry, and would then be another victim of the famine himself.

Do not think that such a condition could not come to pass in this country and other civilized countries, for it is here with us right now; fortunately, however, it is not quite so serious as the Chinese situation was, but it is bad enough to cause our own Government agencies to take steps that have never been used here before to relieve conditions. The deplorable thing is that it takes so much longer to get the distribution machinery operating than it does our production machines. This is unquestionably an indictment against our leaders in the field of merchandising, and represents a condition that we must correct. It means that men with an engineering turn of mind are needed to study the trouble we are having with our problems of merchandising; that every serious thinking business and technical man should give consideration

to it; that we should give more time to the training of our college men coming along now, so that future generations will not be called upon to go through again the most trying economic times that the world has faced for years. The plowing under of one row of cotton in every three or four rows in order to reduce the supply of cotton in this country and the killing of a certain percentage of the hogs may have been the quickest solution for the emergency that we faced in 1934, but it certainly reflected a very weak distribution system, when it is recalled that there were and still are millions of humans without sufficient cotton garments to wear, and enough food to eat.

Why do we have such excesses of cotton goods and other commodities? Because we do not have the proper distribution system to keep pace with our production of these products, and the goods that we produce so economically are distributed so wastefully that the ultimate costs of the finished products (production costs plus costs of distribution) become prohibitive, as far as the ability of the masses to buy them is concerned, and the goods might as well have eaten themselves up in transit, or have been burned at the wharf.

If we would give serious thought to the scientific merchandising of our textile fabrics and related articles, we could undoubtedly make such economies, that we would be able to sell them at prices low enough to put them within the reach of the masses who need such articles, but lack the necessary funds to obtain them at the higher prices. As long as children continue to be born nude, there will always be a field for the development of the products produced by our great textile industry. With lowered prices (made possible by reduced distribution costs), the public will be able to buy more things. The resulting increased demand, will necessitate increased production, which will be accompanied by still lower operating costs, and more employment without reduction in wages. We must therefore give more consideration to the extravagance in merchandising and realize that every waste in the process of distribution increases costs, thereby limiting sales, with the final result—a depressed industry. Our industry along with the other basic industries of the country, depends upon a stable government for a successful future, but the breakdown of distribution here as well as in other countries (or, expressed in other words) the failure of distribution to keep pace with production—is very apt to bring about conditions which will threaten the very foundations of our government.

The ideas associated with scientific merchandising are very new to our industry, and traditional customs are so strong that it will call for our best minds to solve the problems that face the most important, and yet most neglected side of the textile industry, namely, the profitable disposal of the products of the industry, in this country and abroad.

FUNCTIONS OF PURCHASING AGENT AND SALESMEN

So much for the general consideration of the subject, but what about the problem of the average man that makes his living, in the plant, or laboratory, or in the sales office, or purchasing office or those men out on the firing line of every-day business, the travelling salesmen and demonstrators. These are the men who need to have some sort of a new conception of what the new deal in merchandising means in their sphere of activities, for no plan can be truly successful unless the individual members of this important group are functioning as they should be. Great business leaders may plan the finest of sales and production campaigns, but the best plan will fall short of the desired goal, unless every man in the organization knows what he is there for, and what he is supposed to do, and the best way of doing it while working in cooperation with the other members of his organization.

No really great military genius or athletic coach would think of sending his men out on the field of battle or on the athletic field unless they were fully trained to do the jobs to which they were assigned; but our business leaders are often prone to overlook the value of a similar type of training for the men that are sent out to represent their interest in the business world. It is not fair to the men or the trade on which they call to send out a salesman or demonstrator with scarcely any more credentials than a goodly heritage of influential ancestry, or an ability to tell the best stories, and give away the finest cigars; unless he also can lay claim to a reasonable amount of information about the work he is engaged in, and its relation to the interests of the customer or prospect that he is interviewing, and furthermore there must be burning desire to increase his knowledge and keep up with the progress and requirements of the industry. It is not enough for a salesman to know simply the prices and good qualities of his products, but he should have a good working knowledge of the proper way to impart this information and enthusiasm to his prospect, so that the real and actual benefits contained therein may be put to profitable use. It is not at all uncommon to see really better quality merchandise standing idle for want of a capable man to tell the story about it, in a business-like and interesting manner and on the other hand, you will frequently see an article of less commercial value selling like "hot cakes on a cold day" because someone has recognized the importance of putting a little extra time in his preparation for sales work. These truths apply with equal force regardless of whether you are selling your services, ideas, textile fabrics, or the raw materials that are used in the bleaching, dyeing, finishing and the transportation of the semi-finished or finished products to the jobber or final consumer; or whether you are engaged

to buy the results that are made possible by the scientific use of the products that are offered you by the salesman.

In the field of scientific buying and selling, the buyer should remember that he is purchasing *results*, and not simply products, and the results obtained should be more valuable than the mere price paid for the product. For example, a pound of Sulfur Black may sell for twenty cents per pound, but the results that can be obtained by the proper use of this pound of Sulfur Black are worth considerably more than the twenty cents paid for the product; and a yard of broadcloth which may sell for fifteen cents per yard is worth considerably more than this in the hands of the garment manufacturer.

PSYCHOLOGICAL ASPECTS OF SELLING

The preceding remarks on selling would be incomplete without a careful consideration of the reasons why people buy certain things and forego other valuable considerations for the satisfaction of certain wants that are strongest in their minds at the time a purchase or contract to purchase is made. Knowing why individuals and companies buy these services and commodities will help us to place our services and commodities before them in such a manner that a mutually profitable transaction will result.

When you have an idea or product to offer to an individual or a large corporation, and you are convinced that your prospect would be benefited by using your service or product, and instead of accepting your enthusiasm and trading with you, the opposite course is followed, and your plan of action is rejected, you are apt to think that your listener is either unintelligent, crazy, unduly prejudiced, or even hostile to you. It is hard to think that possibly the weakness is on your side and you are the one to be criticized for not knowing how to present your plan so that it will sound reasonable and appealing and will result in your listener acting as you would have him.

In the textile and allied industries, huge sums of money and much time have been invested in the products and services that are offered to the mills and finishing plants; but it is frequently observed that some buyers do not appreciate this fact and instead of trying to cooperate with the salesman or demonstrator to get the greatest amount of value out of this tremendous investment, they often show the tendency to want to repulse him and as a result both firms lose. Someone has to buy and someone has to sell for every worth while concern, and the purchasing agent and the salesman are generally the contact men for their respective firms.

To understand why people react differently under various influences, involves a study of human psychology, and carried a step further in this direction, we find ourselves involved in a brief study of sales psychology.

POWER OF INSTINCTS IN HUMAN RELATIONSHIPS

We would like to think that we are all guided by reason, but such is not the case in every-day life, as we will observe that many of our daily activities and decisions are guided by certain habits and instincts as much as by sheer reasoning. It might be said for the benefit of those who would challenge this statement, that we are motivated by various instincts and influenced by our reasoning.

We are able to enjoy life more fully when we give free vent to our different instincts, but due to the fact that we must live and work peaceably with others, and because certain of our instincts tend to cross each other, we are obliged to control our impulses to prevent getting into trouble. Control of our instincts should not be mistaken for repression of these particular acts, as it is very unlikely that our instincts disappear when suppressed, but often crop out in other directions. To illustrate,—did you ever come to the end of a very busy and somewhat discouraging day's work, when everything seemed to go wrong, and you would like to cuss and show your anger in other ways, after you have been obliged to conceal your feelings under a forced pleasant and smiling exterior? When you get home you can vent your spleen on the neighbor's pets, or on the hotel clerk, or waiter, or you may do the more profitable thing, and use all this extra energy by polishing the family car, or enjoying a good comedy, or spend the evening studying ways and means of preventing a recurrence of the sad events of the day. The point that needs emphasis is that we should control our instincts in the interest of our best welfare.

We will discover a great variety of motives that cause us to buy different services and commodities, but we will always be able to trace each buying motive to some definite instinct that was working on the mind of the buyer at the time of the purchase. The successful salesman will make a study of the people that he comes in contact with, with the object in view of discovering what instinct or group of instincts causes his listeners to act as he wants them to; then, if he thoroughly understands the psychology of salesmanship, his next step is comparatively simple.

This is not the time or place to try to exhaust the subject of Psychology of Salesmanship, but such a study would undoubtedly prove very interesting and unquestionably profitable to all who have never considered this most interesting subject, and I would think that some good book on this subject should be in every salesman's bag. He will find many opportunities to improve those occasional long waits in the reception room while waiting to see Mr. Purchasing Agent.

Let us now take the time to study the motives and instincts that cause us to act.

STRONGEST BUYING MOTIVES

There are several motives that prompt us to buy different services or things, and certain ones will be mentioned briefly. A strong enough appeal to anyone of these buying motives will generally bring quick results.

Self-Preservation

If you can demonstrate to a man that your service or product will enable him to protect and save what he owns, you will usually make a sale, if the cost of the service or commodity does not exceed the value of the possession which your prospect desires to protect. To illustrate,—consider the reasons why bumpers are put on automobiles; why farmers spend money for insecticides; why firearms are purchased; why hair tonic is used; why high fences are built around industrial plants, etc., etc. There was a time when some enterprising salesman had to encounter considerable sales resistance to create these and many other new wants that hitherto were not even thought of.

Property

Men spend their lives in the pursuit of property, and in the enjoyment that riches and profits will bring to them. This motive is actuated by the instinct to acquire increased amounts of the world's possessions. This motive is unquestionably the strongest one that you can appeal to, for men are never too busy to be preoccupied before the prospect of making money or acquiring more property. This was the *impelling motive that started the World War.* It was the *property motive that started the Florida real estate boom several years ago;* and also the same one that resulted in the steam engine, the automobile, etc. *If you can prove to any prospect that what you have to offer will make him richer in the world's goods, you have made another sale.*

Power

This motive is very similar to the last one, and it is very effective. If you find a man who is very keen to acquire power, high office, exceptional skill, notoriety and fame you will find the dominant buying motive in this man will be aroused by showing him to his satisfaction where your plan will give him these things. *The power motive instigated the recent textile strike.*

Reputation

The desire to receive the praise of one's fellow men as a reward for building an enviable reputation is still another strong buying motive. *Men are instinctively imitative. They like to follow tradition and convention and to be well thought of.* Show a man how to manufacture or merchandise his goods better than anyone else and you appeal to this strong desire for praise and excellence, increased prestige and profits, and furthermore, you can usually do business with him on this basis.

Other Buying Motives

There are many other buying motives, such as the Parental Love motive to which insurance companies appeal. The instinct of loyalty, affection, hunger and rivalry, are also appealed to with equal effect on various occasions.

Before you can be sure of the proper approach and the correct motivating instinct to appeal to, you must know the type of person that you are dealing with.

TYPES OF CUSTOMERS MET EVERY DAY

There are many types of individuals met every day in the routine of business, and each one must be handled differently and as a distinct individual having an entirely different group of instincts which motivate his buying actions.

Impulsive Type

This type is generally very quick and nervous, high strung, hasty in actions and manner of speech. This type wants action because they feel that they are too busy to waste any time with you and if they do give you a chance to tell your story, they expect you to get down to business promptly and explain quickly and clearly what is on your mind. *They think quickly, but not always correctly,* and if you are not a seasoned man in your line, you would do better to let this type go to some other older member of your firm or spend a larger part of your spare time preparing your case before calling on a man of this sort. *They are not as mean as they sometimes act,* and outside *of business relations they are often just the opposite of what you find them to be in their office.* Most travelling men will agree that this type of buyer is to be found almost exclusively in the highly congested business areas, where it is not so expensive to travel, due to the larger number of potential customers within a small radius, and therefore the buyer apparently finds it necessary to be more impulsive and hasty to enable him to get his day's work done and give as much time as possible to the larger number of travelling men that generally work a restricted territory.

Deliberate Type

You will find this type everywhere. They are very certain in their manner and their actions are usually the result of careful and deliberate considerations of the subject. They generally want plenty of time to think about your proposition, and give you every opportunity to explain your case, and even though they may feel at the outset that they will not be interested, *they have an open mind and are willing to be shown where and how they can improve their work or lower their costs. This type generally make the best purchasing agents. They almost always treat the salesman fairly and do not divulge any confidence that may be placed in them by the seller.*

Indecisive Type

Some buyers find it very difficult to make up their minds, and are in the habit of changing their opinion frequently. They are flighty and you never know what they may have done since your last call, but the chances are strong that they have been trying some other products or fabrics and are not sure which they like the best, but they tell you on your next call that your article was not as good as some others they have been trying since you were there last. Not infrequently this attack on the salesman is designed to try to get a price concession.

Confident Type

This type is usually made up of the men that have had a training in the plant and are generally gifted with a very clever engineering turn of mind. They know exactly what they want and recognize quality quickly; they do not squabble over the price as long as the product is giving satisfaction, unless the consumption is very large, and then they buy on the lowest bid, and generally split the business with two or more reputable concerns to insure a competitive market and dependable source of supply at all times.

Talkative Type

This type is found in sparsely settled districts. They are very friendly and like to talk for hours about the things that interest them. They scarcely see as many travelling men per day as the impulsive ones. This type has a lot of friends who bring them all the news of the day, as only the travelling man can do in his inimitable style. This is the easiest type to break a new salesman in on, as they show a friendly attitude which tends to give the young travelling man a little more courage.

Silent, Suspicious Type

This type takes all you say with a grain of salt, they are non-commital, very cautious, and often cynical. They take no stock in any reference to quality, have almost nothing to say, and give practically no clue as to what they might need. They expect the salesman to do all the talking, but give no hint to let him know whether they are interested or even listening.

Other Types

There are other types that are generally mixtures of those previously described, but *every now and then you will run across the type that seems to delight in keeping the travelling man waiting unnecessarily long, often one to two hours or longer. Such practices should be discarded in the interests of a more scientific merchandising plan, for it cannot be disputed that such waste of the travelling man's time adds materially to the cost of merchandising and it is at this very point that some of the finest opportunities are to be found for reducing the cost of putting the finished goods on the market.*

SUMMARY OF BUYING MOTIVES

It may be said that a person's character or tendencies are determined by the degree to which he possesses the various instincts that cause him to act.

It is quite common for a salesman to find a buyer without any particular buying motives tending to cause him to act on certain occasions, but the fact of the matter is that his buying motives are only dormant or are covered up entirely by thoughts of other duties or pleasures that are occupying a more prominent place in the buyer's mind at that time. It is then the salesman's task to employ all that he knows about sales psychology and try to awaken or bring to the surface the buying motives that he has found to be most effective with this particular person. A salesman is justified in offering his products or services to a prospect if he knows that they will satisfy his needs as well or better than some other service or commodity which might be offered. *Of course, a salesman to be successful must understand his customer's point of view, and seek to further his best interests. This implies that the most effective salesman will know many of the problems confronting the buyer, and if the buyer has confidence in the salesman's judgment, experience and ability to help him with his buying problems, the chances of a mutually profitable transaction are much greater here than where this confidence and mutual understanding are not present.*

In the past, it has been quite common for a salesman to substitute a more or less stereotyped line of sales talk that is not based on facts, for the more sensible line of plain common sense reasoning that most buyers appreciate. The results of such sales attack are generally unsatisfactory for if the salesman's rash claims for his product carry the buyer away and cause him to try the product, it will eventually mean considerable waste of money to the two firms, a loss of confidence in the salesman and his firm; and what is apt to be more destructive, the buyer is made more cautious than ever on future requests for trials of new products that are offered to him as a means of reducing his expenses. Therefore, he has the tendency to pass up real opportunities to make a saving in his purchases, due to the unethical tactics of some inconsiderate or insincere salesman. There is no substitute for honesty and fair dealing in successful merchandising, and there is great need for a more sympathetic and mutual understanding of the problems of the buyer and seller. The buyer is not always able to interview the seller without delay, and the seller is not always abe to be present when the buyer has the most time for him, therefore, a finer appreciation of the value of each other's time would go a long way toward establishing that ideal realtionship that is quite essential to any real progress in merchandising problems. The small and large buyers have their place in scientific merchandising plans and

the same applies to the small and large sales organizations, but there is no room for extravagance or bitterness in either, and one should realize that without the other to assist them, their tasks would be made very difficult indeed.

CONCLUSION

The greatest possibility of further progress in industry is to be found in a study of the sound principles of scientific merchandising, so that industry will be better able to spend that fifty cents (approximately) of every dollar paid for materials, to better advantage, and thus reduce the costs of goods to enable the great masses to enjoy them, without reducing the wages to labor. The concern which neglects this important side of its business, may find it increasingly difficult to compete with organizations which apply the principles of scientific purchasing and selling. Scientific purchasing does not necessarily mean buying goods at the lowest price, but for the greatest ultimate economy in the purchasing and utilization of materials that are needed in the carrying on of that industrial or mercantile establishment.

Scientific merchandising is a phase of management that should be studied and applied not only from the broader economic aspect, but from the standpoint of the individual concern that needs to reduce its costs, to enable it to reach out and extend the markets for its products. To neglect this possible means of increasing business, may ultimately spell defeat in the competitive race of industry by those more progressive firms or foreign countries that see the possibilities involved and are quick to grasp the advantages and reap the greater profits.

Mr. Thompson: Gentlemen, I have had to skip over a good many things in this paper and I hope that those who are here today will read the complete paper when it appears in the DYESTUFF REPORTER, not for what I say but with the sole idea of getting started within you a better understanding of what it means to dispose of your services, your products, or whatever you may be interested in, in a more scientific fashion than you have been accustomed to using in the past, so that we can get our merchandising system, whether it be selling goods or services, on a far better plane than exists now, so that we will not have such a condition in this country as existed in China in 1930 when they had more rice in the country than they knew what to do with and yet literally millions of people died from starvation simply because they couldn't get the rice to them. There was no adequate means of distribution.

The seller should understand that he is not buying products; he is buying results. Sulfur Black may sell for twenty cents, but the results you can produce with Sulfur Black costing twenty cents are infinitely greater than the amount of money you paid for it.

Keep those things in mind and don't think that just because you are a purchasing agent you have nothing in common with the salesman. Without the salesman, you couldn't do your job. You would have a harder job than ever trying to buy the materials you need for your firm.

So what is needed is a little better understanding between the buyer and the seller, and that is the first step in the interests of more scientific merchandising. (Applause.)

MEETING, PHILADELPHIA SECTION

THE Philadelphia Section held the second meeting of this season on Friday, January 11th, at the Broadwood Hotel in Philadelphia. Following the usual routine business the subject of this year's annual convention was presented for discussion. The reasons being that several years ago the Council drew up and had published in the REPORTER a schedule assigning the annual convention to the different Sections in a definite order and in accordance with that schedule this year's convention was assigned to the Philadelphia Section. It was also mentioned that the South Central Section had petitioned the Council to permit them to act as host for this year's convention because they had not had this privilege since their formation. A resolution was adopted to instruct our Councilor to inform the Council at its meeting on January 25th, that the Section was agreeable to the southern Section's request, but with the understanding that next year's convention would be assigned to us.

Following the business meeting Harold B. Dohner presented a brief resume of the most recent developments in textile assistants as reflected in recent patents. This was a continuation of a similar presentation at the last meeting.

Following this George W. Pierce of the Kraemer Hosiery Co., presented a prepared paper on "The Dyeing of Cellulose Acetate Fibers."

Norman Wilson of the Joel Bailey Davis Co., followed with a motion picture illustrating "The Manufacture of Ringless Full-Fashioned Hosiery." This film was obtained through the courtesy of the Berkshire Knitting Mills.

The final address was a prepared paper by Joseph E. Goodavage of the Philadelphia Textile School, entitled "Stainless Steel in the Textile Industry," which was followed by the presentation of a motion picture by Chris. C. Snyder, metallurgical engineer of the Republic Steel Co., illustrating various processing in the manufacture of alloy steels.

The usual informal dinner preceded the meeting. Attendance, 101 at the dinner and 115 at the meeting.

Respectfully submitted,

CHARLES A. SEIBERT, *Secretary*

Proceedings of the American Association of Textile Chemists and Colorists

The New Textile Technology*

By E. R. SCHWARZ†

THE older textile technology was concerned with the grosser phases of textile structure and with few exceptions its literature is filled with studies of externals. These studies, however, have in more recent years led to investigations of the more minute structure. George Bernard Shaw once said, "Science is always wrong. It never solves a problem without creating ten more." What Shaw believes to be true of science in general applies equally to textile technology in particular. Much of the development of the new technology in the field of textiles is attributable to this fact.

Each research on fabric or yarn strength, for example, showed sooner or later that the lack of information as to the detail of fiber structure and fiber properties handicapped the worker. Thus it is known that moisture picked up from the surrounding atmosphere has a profound effect upon the strength and stretch of cotton yarns and fabrics. These materials were found to increase in tensile strength as the moisture regain increased. Thus a fabric testing 150 pounds per inch when dry was found to test more than 250 pounds per inch under standard conditions of humidity and temperature. Such discrepancies led to the development of controlled humidity rooms for testing (see Fig. 1), and eventually to the accumulation of enough data to furnish the mill man with correction tables and charts which enabled him to perform his tests at the prevailing conditions in his plant and then to correct them to standard or to any other desired condition. During the studies of this behavior of cotton cloth, it was shown independently in this country and in England that the rate of change of strength of cotton fabric for mechanical goods, expressed as percent of the dry strength per percent of moisture regain, was substantially equal to twice the square root of the weight of the fabric in ounces per square yard.

The question at once arose—"Why should fabrics of the same weight per square yard have the same rate of strength increase?" Evidently the phenomenon was connected in some way with the weight of cotton in the goods. How does the moisture get into the fibers? How is it held there? Why and how does it influence the strength of the yarn or fabric, and of the fiber itself? Preliminary studies indicate that when moisture is picked up or lost by the fiber, there is a change of fiber temperature. How much heat is generated? Why is it generated at all? What forces hold the molecules of moisture to the molecules of cellulose?

Hence from a consideration of the strength of heavy canvas duck measured in hundreds of pounds by the technique of the old technology, we have come to a consideration of the ultimate structure of fibers in terms of molecules as shown by the techniques of the new technology.

These molecules which the chemist knows as cellobiose residues are so small that if a man were to count them at the rate of one per second, eight hours a day, five days a week, it would take three million years to complete the counting of the molecules of one cotton fiber.

How can measurements be made of anything so minute? The new textile technology supplies the answer. Since the wave length of the X-ray beam may be made far less than the molecular dimensions of the cellobiose unit, X-rays become a means for fiber study. So short are these waves, in fact, that many thousands of them can be shot simultaneously through a single cotton fiber, giving quantitative records which make possible the analysis of the atomic structure of the fiber.

What does the utilization of such delicate methods of test reveal? According to Astbury, the presence of crystalline matter in substances which have been supposed to be amorphous, can be detected positively. The direction in which the crystals lie in the body under examination can be shown. The dimensions of the crystals can be estimated. The distance at which the molecular pattern on which the architecture of each crystal is based, repeats in the various directions of its structure can be measured. Finally, with sufficiently perfect technique, the actual positions of the atoms and molecules, and hence

Fig. 1—Unit for controlling laboratory conditions of temperature and relative humidity at the Textile Laboratory, M.I.T.

*Presented at Annual Meeting December 8th.

†Associate Professor of Textile Engineering, Mass. Inst. of Technology.

their size and shape, can be deduced. To form a textile analogy it is as if a man, deprived of his senses of sight and touch, acquired some faculty by means of which he could investigate the contents of a table strewn with pieces of a patterned fabric. (See Fig. 2). If he were endowed

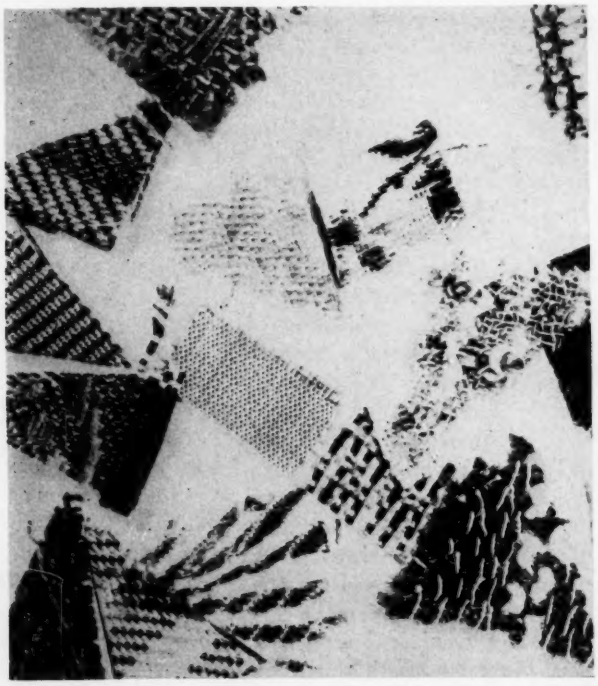

Fig. 2—Fragments of patterned fabric simulate conditions in x-ray studies of textile fibers.

with a faculty corresponding to the X-ray methods of physical research into the properties of matter, he would show that the pieces of fabric were really patterned. He could show which way they were lying on the table. He could estimate the dimensions of the pieces. He could calculate the size of the repeat in the pattern. Finally he could deduce the exact details of the repeat.

By means of such powerful weapons for the attack upon the structure of cellulose, fibroin and keratin, we are allowed, to all intents and purposes, to wander about within the actual structural framework of the cotton, silk and wool fibers respectively and measure and study to our heart's content. But we have reached one extreme. Here atomic and molecular structure is under investigation. At the other extreme is the usual mill-study of strength, stretch and other physical and chemical properties of yarns and fabrics.

An analogy between well known magnitudes and those involved in the old and new technologies may be crudely drawn, and may aid in clarifying the comparison. A fabric (see Fig. 3) or yarn may be considered as resembling a city seen from the air. Each building then

Fig. 3—The surface view of a fabric is like an aerial photo of a big city.

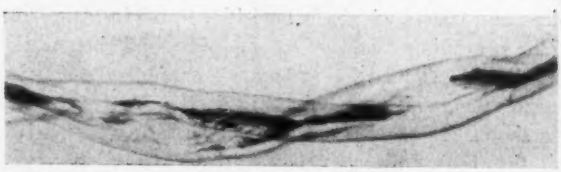

Fig. 4—A single cotton fiber corresponds to a building in our analogy.

represents an individual fiber. The man in the mill is directly concerned with yarn and fabric, and indirectly concerned with the fibers themselves. The old technology was also concerned largely with fiber as its ultimate unit.

Now if we consider one building in particular (or a fiber, if you will) (see Fig. 4), its structure is of interest and importance to the new technology. If we step inside such a building we can see something of the network of piping, wiring, partitions, girders, foundations, etc. We see what (in a fiber) the microscope reveals in ordinary use. (see Fig. 5). But the new technology goes further

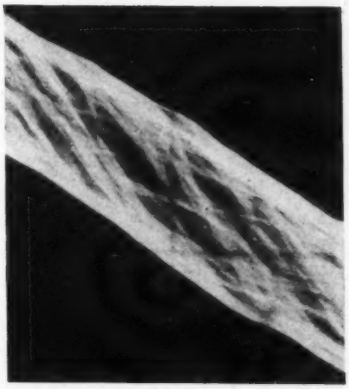

Fig. 5—The fibrillar structure of a cotton fiber is like the framework of a great building.

than this. Not content to study the normally visible structure, it seeks to probe into the secrets of the ultimate constitution of the fiber.

In the case of the building, the expert in ceramics can use a polarizing microscope to study the structure of the synthetic brick, tile and plaster. The metallographer can use his polishing and etching technique to bring out through the microscope the crystal structure of the steel and of the brass used in the framework and the hardware. The botanist can show the intimate details of the cell structure of the woods involved. The petrographer can show (again in polarized light) the structural elements of the rock on which the building rests. (see Fig. 6). Each contributes positive information of great value to the structural engineer.

Fig. 6—Polarized light allows studies of fiber properties as well as those of ceramics, rock, glass, etc., in a building.

Paralleling this, the modern textile technologist studies the structure of fibers which would otherwise be invisible, by means of the coloration and other effects resulting from the employment of polarized light, ultra-violet light in conjunction with fluorescent dyes, and X-rays. The newest contribution of the scientists in the fields of biology, physics, chemistry and mathematics are being tested and wherever possible they are being applied to textile research. The latest efforts in physics, for example, center about problems of atomic structure. The extraordinary developments in the fields of spectroscopy, and of the generation of extremely high voltages are specific instances of technique. The latter through the construction of high voltage generators like that built at M.I.T. by Prof. Van de Graf will perhaps lead to the splitting of the atom, the liberation of vast amounts of energy, the better understanding of the creation and constitutions of the elements.

Not content, as in our analogy, to examine the details of building structure, the scientist of 1934 is trying to make the ancient alchemist's dream of the transmutation of the elements come true. The synthetic dye industry is well aware of the fact that radical changes in color and properties can be made by proper manipulation of the ubiquitous benzene ring. Perhaps synthetic fibers will eventually have as far-reaching changes wrought in them by substitutions of atoms and fragments of atoms in the basic molecules of their structure.

But just now we are not concerned with the quite well established routine physical tests on one hand, nor with the details of ultimate molecular structure on the other. More and more we are concerned with the great open space existing between these two fields of endeavor. There is a type of fiber structure intermediate between the ultimate molecule and atom, and the microscopically visible fibril. Workers are agreed that it is made up of a number of long-chain molecules. One concept pictures an intermediate unit which is shaped like a brick and which according to this view is actually the individual building block of fiber structure. The data upon which the concept is based rests largely upon chemical disintegration, swelling, solution, or colloidal suspension of the cellulose. It necessarily involves a change in the original fiber, and it is somewhat dangerous to reason backward from such information to form a picture of what the structure of the untreated or native cellulose must have been. Unfortunately we are dealing with something which must be determined by indirection. The microscope is not powerful enough to let us see it in its actual form. And in saying this it is with full realization that certain workers have claimed to have rendered the ultimate structural unit of the secondary wall of the cotton fiber visible under high magnification in the microscope. The particles thus observed were stated to be of the order of magnitude of 1.5 microns long by 1.1 microns in diameter. Each particle was shaped something like a football, and was said to be coated with pectic substance. The dimensions cited are consistent with the type of X-ray diffraction diagram obtained upon masses of the isolated units, but do not seem in accord with the necessary dimensions of an ultimate unit of wall structure. There would seem to be little doubt but that the material par-

ticles seen were cellulosic and pectic in nature. Further they perhaps resulted from the breakdown of fibril bundles which form the wall. But since the average wall thickness of a cotton fiber is on the order of three to seven microns, and since many fibers have been shown by various technicians to have a secondary deposit made up of as many as thirty concentric layers which can be seen both in longitudinal and in cross section, it is obviously not possible for any one layer to break up into particles one micron in diameter. Since evidence has been presented in support of the statement that each layer is independently laid down with respect to time, it is further apparent that particles of this size could not exist in a single layer. Apparently a smaller unit must be sought to account for the growth phenomena.

The length of the long chains making up what has been termed a *micelle* (a word which has been variously defined—or which has in many cases unfortunately lacked definition entirely) is unknown but is thought not to be a constant quantity. It would seem that the concept of a micelle as a discrete crystalline unit of definite and regular dimensions is not necessary to explain the X-ray data. In fact Mark and Hengstenberg have noted that before such a micelle can be dimensionally calculated from X-ray diffraction patterns (see Fig. 7), five assumptions

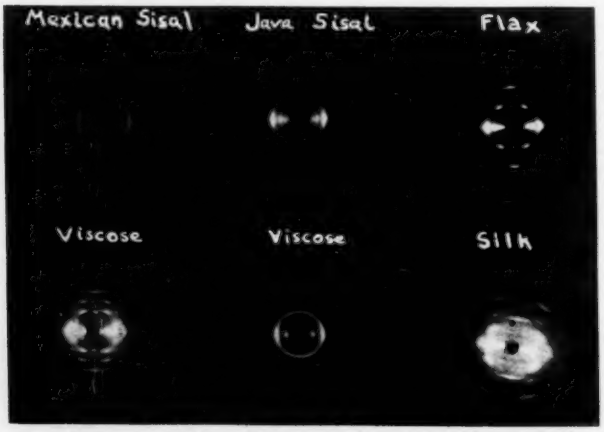

Fig. 7—X-rays show ultimate details of fiber structure as well as that of structural materials.

must be made. First, that the absorption of X-rays by the sample must be negligible. Second, that the micelle must have only one definite size. Third, that all micelles must have identical crystal structure. Fourth, that heat action must have no appreciable effect. Fifth, that the lattice structure of each micelle must be perfectly formed and undistorted by the presence of impurities or strain. It does not seem, in view of the known complication of cellulose structure, that all of these assumptions, and particularly the last, can be entirely justified.

Still another hypothesis supposes that the cellulosic natural fibers are made up of long-chain molecules which have crystallized imperfectly so that the wall is permeated with discontinuities and irregular regions which behave in X-ray analysis in a similar fashion to amorphous material. In a fiber such as ramie, where the degree of orientation of structure parallel to the axis of the fiber is high, these discontinuities are very evident. They may eventually cause rupture and fissures visible microscopically both externally and internally in the fiber. They are frequently of such magnitude that an impression may be taken of them in the form of a celluloid cast. Osborne, in a report to the Textile Foundation, has discussed this phenomenon as studied in an investigation conducted under the direction of the speaker, in detail. More minute discontinuities are evident in the irregular joints and nodes which exist in ramie. Under polarized light, and at high magnification and resolution as obtainable with an oil-immersion lens, direct color photo-micrographs show the delicate graduations of color which must here be due to changes in specific index of birefringence due to stresses which vary locally. To a much less degree similar coloration is found in other fibers, notably cotton. The orientation of the fibrils in cotton, however, is less nearly parallel with the fiber axis, except at points of spiral reversal. The matter of orientation should be understood more perfectly. There are a number of orientations involved in a cotton fiber, for instance. It is necessary to differentiate clearly between them in order to avoid the confusion which is already beginning to become apparent in the literature. The orientation of structure of a cotton fiber is evidenced by the convolutions as visible by the older methods of study. The newer methods, however, make possible determinations of the internal orientations. The usual X-ray technique shows not only the deviation of the ultimate structure within the fibril, but at the same time shows the various spiral directions of the fibrils themselves. The technique of Morey involving polarized fluorescence, gives a measure of the first of these two orientations independent of the second, and at a point in the fiber regardless of the direction and magnitude of the spiral of the fibril at that point relative to the fiber axis.

While the long-chain molecules are largely parallel with the axis of the fibril as is shown by the practically complete extinction of the fibril in the parallel positions, nevertheless they are rotated at random about their own longitudinal axes so that the X-ray diffraction pattern resembles a rotation diagram of a single crystal, even though the fiber remains stationary. It is perhaps safer to refer to the orientation of the fibrils as spirality and to reserve the term *orientation* for the lining up of the crystalline aggregates of which the fiber is composed.

The mystery of why the flax fiber is always spiralled with "S" twist, while the jute fiber is always spiralled

with "Z" twist remains unsolved. The question of why the structure of the cotton fiber should involve both "S" and "Z" spiral arrangement of the fibrils remains unanswered, and the problem of how the reverse spirality is produced is still not satisfactorily solved. Possibly enough has been said to indicate something of the nature of the no-man's-land which lies between the extremes of modern scientific research in fiber structure. It remains for further applications of polarized light, ultra-violet light and fluorescence, soft radiation and ionized gases, together with the physico-chemical techniques of ultra centrifuging, swelling and colloidal suspensions, to aid in completing the picture. Such structure is responsible for the physical properties of the fiber. Strength, brittleness, torsional resilience, plastic flow, etc., are all of considerable importance to the manufacturer. The fact that plastic flow in rayon affects the dyeing properties interests the dyer and finisher. The brittleness of ramie bothers the spinner, weaver and user of textiles involving this fiber. The complicated collapsed structure of the long-chain molecules of keratin accounts in large measure for the unique behavior of wool in felting, and other finishing operations.

It has been said that if the invisible structure of cellulose and silk is analogous to that of a sliver composed of the straight, parallel fibers themselves, then the structure of wool fiber is analogous to that of a sliver of strongly crimped wool. The plastic flow or slippage of the crystalline aggregates corresponds to the drafting of the textile slivers in which the fibers slip by each other as the process progresses.

Under proper conditions a wool fiber may be stretched an amount equal to its original length without sign of failure. With the removal of the stress, the fiber can be returned to its original length. The next time it is easier to stretch than it was before. Speakman has shown that wet wool fiber twists fifteen times as easily as dry fiber. The internal structural elements then, must shift about without rupturing. In the light of these and other similar refinements of the older technology, the new technology proceeds to form a picture which day by day becomes more and more perfect in evidencing the exact nature of the invisible universe of every textile fiber. There are whirling electrons in every molecule. There are complex molecules crystallizing into various types of chains and aggregates through either natural or artificial processes of growth. There are self orienting fibrils, reinforcing the fiber in a way more perfect by far than any engineer has ever been able to fabricate his buildings. The whole contributes not alone to the romance of scientific achievement, but holds out a brilliant promise to the textile research worker and in turn through him to the textile manufacturer and ultimate consumer.

The old textile technology need not be displaced. It need not stand aside in favor of the new. Rather it has its definite contribution as has the new. Oliver Wendell Holmes' statement that "The great thing in this world is not so much where we stand, as in what direction we are moving", applies to textile research directly. The measure of the success of the textile research of the future will be the efficiency with which the old and new textile technologies are combined and harmonized.

Anatole France said, "The Sciences are beneficent. They prevent men from thinking!" Not at all! The old textile technology presents a challenge which should stimulate the textile man to greater effort and to more intense thought, that the new textile technology shall thrive and be fruitful.

President Rose: It needs no comment from me to tell Dr. Schwarz that we enjoyed his talk immensely, and it is just that sort of inspiration that leads to our mental cells finally vibrating in such a way that we understand what is going on in the fibers with which we deal.

This completes our technical program. We will now go into the business meeting.

. . . Following a short recess, the business session convened. The report of this session will be published in the next issue.

NINETY-SECOND RESEARCH COMMITTEE MEETING

THE 92nd Research Committee meeting followed the Council meeting in Providence on Friday, January 25th. Present were Chairman Louis A. Olney presiding, J. R. Bonnar, W. H. Cady, Hugh Christison, C. Z. Draves, W. C. Durfee, H. F. Lawton, J. G. Masson, W. R. Moorhouse, G. A. Moran, B. A. Ryberg, R. E. Rose, and H. C. Chapin.

Mr. Ryberg described his research on carbonizing with aluminum chloride, and Mr. Cady the research on printing in which Dr. Glarum is engaged. Discussion of both followed.

Mr. Christison reported for the Committees on Determination of Extraneous Matter in Textile Materials, and on Fastness Tests for Dyed Wool. It was voted that the standard dyeings recently recommended by the Committee on Fastness Tests be adopted as the standards of the Association for washing tests. Mr. Christison expressed the opinion that the perspiration tests, already more drastic than those used abroad, would have to be made still more drastic to meet trade requirements. He suggested that this be given further consideration by the Research Committee at a later meeting, perhaps the next, in New York, on March 1st, when more representatives of dye manufacturers might be present.

Respectfully submitted,

HAROLD C. CHAPIN, *Secretary*

Proceedings of the American Association of Textile Chemists and Colorists

Factors in Single Bath Dyeing of Silk with Sulphon Cyanine Black B†

By GRAHAM COOK* and CHARLES SCHEPMOES**

ONE of the important dyes in the dyeing of silk hosiery is Sulphon Cyanine Black B[1] sold under various trade names, and used extensively. Many dyers have experienced difficulty with this dye, particularly in the single bath method. It often fails to "feed on" properly. This difficulty has been attributed to many different causes, and the remedies suggested have been various.

An excellent study of this problem has been made by McGinty and LaQue[2]. As a result of their investigation they concluded that poor dyeings with this black were due to a "reduction" of the dye itself during the dyeing process. The speed and amount of this reduction they attributed to four factors: (1) the sericin from the silk: (2) the pH of the solution; (3) the temperature, and (4) the quantity of air in the bath. That is, their experiments indicated that the sericin reduced the dye, and that the speed of the reduction depended upon the temperature and the pH of the solution. This reduction, however, could be prevented by admission of air to the bath. They stressed the importance of the latter factor, and suggested that in all dyeings with this dye that air be blown into the bath.

This paper was reviewed in "Textile Research"[3] and the suggestion made that the problem warranted further study. An investigation of a similar dye, Sulphon Cyanine Blue, made by Millson[4] showed that it was very sensitive to temperature effects in dyeing on wool. He made the statement that it appeared to be very susceptible to heat and oxidation. A further study of the effects due to pH has recently been made by Daniel.[5] He proposed some changes in the method of dyeing with regard to this factor, and suggested that the dye be added *after* the pH of the bath had been brought down to about 9.0. He made no further study of the three other factors suggested by McGinty and LaQue[2] but stated that the dye machine should be left open after the addition of the dye.

It occurred to us that this problem might be further simplified. In spite of the conclusions of McGinty and LaQue, the possibility still remained that the process of admitting air to the bath also cooled it appreciably. If so, this cooling would prevent destruction of the dye, as noted in their study of the temperature effects. The results of the present investigation indicated that this was true: that the air did not chemically prevent "reduction" of the dye by the sericin but that *the air cooled the bath to a temperature at which the reaction between the sericin and the dye was so slow that no appreciable quantity of the dye was destroyed.*

In all our experiments we used sample skeins of silk "in the gum," weighing nearly 5.0 grams. We did not adjust the weight of each skein to just that amount, but weighed each one and adjusted the proportions of dye, degumming agent, and Glauber's salt accordingly. None of the skeins used varied in weight from 5.0 gm. more than 0.4 gm. These were dyed with ½% Sulphon Cyanine Black B in a bath volume of 200 cc. (40-1). 10% of Bickanol D was used as degumming agent in each case. The finish was made with 20% Glauber's salt. All percentages given are figured on the weight of the silk. Dyeings were made in Pyrex beakers on a steam bath or a hot plate, or in an autoclave, or in the apparatus described below. The times of dyeing were from 40-60 minutes, with 20-30 minutes for the finish with Glauber's salt. Any change in the time and in this general procedure will be indicated in the individual experiments.

We first repeated some of the previous work[2], in order to be certain that metals of the dyeing machines were not responsible for destruction of the dye. In Pyrex beakers, we found that addition of finely divided copper, nickel or brass, or Monel metal disks, caused no change in the shade obtained with the dye from that obtained if they were absent. This confirmed the results of the previous investigations. To carry the tests even further we made additional dyeings in Monel metal beakers. In these all-Monel metal beakers (400 cc. capacity) with or without added copper, nickel or brass, in all cases we obtained

†Presented at Meeting, Piedmont Section, Nov. 10th, 1934.
*Professor of Chemistry, Albright College, Reading, Pa.
**Chief Chemist, Bick & Co., Inc., Reading, Pa.

shades identical with those obtained above. This appears to be additional confirmation that Monel metal in the dyeing machine is not responsible for poor dyeings with this dye.

We also found the same temperature effects. We obtained excellent dyeings in glass beakers at 203° F., but at 212° F., or as near as we could get to that temperature in open beakers, we obtained poor dyeings. We also extended these tests further. We used a steam autoclave, which at a pressure of 10 pounds of steam gave us a temperature of 240° F. We first dyed a sample at 212° F. then put it into the autoclave for five minutes at 240° F. The dye was slightly destroyed. We then put the dye in the autoclave for 60 minutes at this highter temperature. There was very little dye left on the fiber, and all the dye in the bath was completely destroyed.

McGinty and LaQue showed that the dye could be destroyed in a bath with sericin alone. We repeated these experiments at a higher temperature, 240° F. We obtained sericin by degumming for 40 minutes at the boil, then removed the skeins from the bath. Dye was added to this solution, and this kept in the autoclave for 60 minutes at 240° F., taken out and examined, and then put back for an additional 90 minutes. With sericin and degumming agent, the dye was nearly destroyed at the end of 60 minutes, completely so at the end of 150 minutes. The same degree of destruction was observed in a bath containing sericin, degumming agent, and Glauber's salt. We repeated this same process with baths containing dye and water only; dye and Glauber's salt; dye and Bickanol D; dye, Bickanol D, and Glauber's salt. In these solutions, with the sericin absent, the high temperature for this length of time had no effect that could be observed. It is evident that the temperature effects some reaction between the sericin and the dye.

We did not feel, however, that the question had as yet been answered as to whether this destruction of the dye was really a true chemical "reduction," or some other type of decomposition reaction between the sericin and the dye. Certainly if it were a reduction, addition of air in the bath would tend to prevent it. We first attempted to answer this by passing pure oxygen gas through the bath, and then hydrogen gas, and noting the results. This was done in beakers covered with watch glasses, heated to boiling temperature. Under such conditions we found no change in shades obtained with either oxygen or hydrogen.*

It was apparent that we would have to duplicate much more closely in the laboratory the actual conditions of the plant. In the usual dyeing machine, heat is furnished by steam blown in under pressure. To heat the bath rapidly, this steam is usually admitted through large openings in generous amounts and under pressure. With a closed machine and a heavy load of goods, rather high temperatures may be obtained, probably several degrees above the boiling point. There may be spots in the bath that are heated unusually high; at least the heating will not be even. In an open beaker, or even a beaker covered with a watch glass, heated on a steam bath or a hot plate, or immersed in a heating solution, a uniform temperature of 212° F. will not be attained throughout the bath. As the skeins are worked in the dye bath, it is further cooled. The conditions of the dyeing machine are certainly not reproduced; this we believe, accounts for many of the discrepancies between laboratory and plant results. With this in mind, we devised an apparatus for dyeing in the laboratory which gave us, in this case at least, exactly the same results as obtained in the dyeing machine in the plant. We used only simple materials that can be found in any laboratory, and for which we make no prior claims of discovery. A casual search of the literature, however, has failed to indicate to us that such a set-up has been used in dyeing experiments heretofore. Our assembly was really a small steam heated dyeing machine of Pyrex glass, part of a set-up similar to that used in organic chemistry instruction laboratories for steam distillation experiments. Steam was generated in a 2 liter flask, which was blown under its own pressure into a second flask which contained the dye bath. This was an ordinary 300 ml. Kjeldahl flask. Steam entered from the generator through a ¼-inch tube extending almost to the bottom of the flask. Another ¼-inch tube which paralleled this tube was used for blowing air into the bath. A thermometer was also provided. The top of the flask was fitted with a rubber stopper, which had an additional outlet tube slightly smaller than the inlet tubes, so that there was always a slight pressure in the flask. This was immersed in a water bath kept at boiling temperature so that there would be no cooling from the outside. Thus we were able to get an even temperature, very closely controlled. No provision was made for shaking, as we obtained sufficiently even dyeings on the small skeins from the agitation caused by the steam. If necessary, a mechanical shaker could be easily attached to the flask.

With this apparatus, a series of dyeings were made with samples and amounts of materials the same as in the previous experiments. In these, however, we did not finish with Glauber's salt. In the first experiment, *steam only* was passed into the bath. The temperature was maintained at 212°-214° F. At the end of 60 minutes, the dye in the bath began to fade, and at the end of 90 minutes, it had completely disappeared. The shade obtained on the dyed silk was much lighter than that obtained by dyeing in open beakers. In the next experiment of this series, we passed a *very small* current of air through the bath (at the rate of about two bubbles a second). This lowered the temperature only slightly. It was just at the boiling point, 212° F. The dye was also destroyed here,

*Some of these dyeings were madeb y Mr. Albert Elleni, senior student at Albright College.

and practically the same light shade obtained on the sample.

In our third experiment of this series, we passed a *strong* current of air through the bath during the dyeing process. At the end of 90 minutes, there was still an excess of dye in the bath, and the sample obtained had a much *deeper shade* than in either of the two experiments immediately preceding, and more nearly like the shade obtained in beaker dyeings. But the stream of air had lowered the temperature in the bath to 203°-205° F.

We next attempted to heat the air stream entering the bath. But if the air was hot enough to raise the temperature of the bath appreciably, it was evaporated so rapidly, that we were not able to make successful dyeings.

It was quite evident by now that a large quantity of air did lower the temperature of the bath. But with a small amount of air, which did not lower the temperature, yet which was sufficient to furnish a quantity of oxygen to the bath, destruction of the dye was still observed. But the quantity of air might not have been enough to prevent a "reduction," if such were occurring. Therefore, in our next experiment, we passed a stream of *pure hydrogen* through the bath, instead of air. Certainly if oxygen prevented reduction, hydrogen would not. It would seem more likely, that if oxygen prevented such a reduction, hydrogen should hasten it, at the same temperature. Hydrogen was passed into the bath not quite so rapidly as the air, but in such quantity that the temperature did not go above 207° F. At the end of 90 minutes we had results almost exactly the same as when much air was blown through the bath. Excess dye was left in the bath, and the sample had nearly the same shade. It had a shade much deeper than we obtained when no air, or very little air was admitted to the bath.

These experiments certainly seem to indicate that aeration of the dye bath does not chemically affect the dye, but simply acts to lower the temperature, and hence slow up the reaction by which the sericin attacks the dye, or acts in some way to cause it to decompose. It may be that the sericin partly breaks up, and one or more of the constituents of the protein react with the dye. Or it may be that the sericin simply acts as a contact agent in promoting instability of the dye, in the presence of the other substances of the dye bath. We are carrying out further studies on the physical chemistry of this reaction, to determine if possible, its true nature, and the quantitative rate of change with temperature.

It is evident, however, from the results of our work up to now, that only three factors are involved in causing variations in single bath dyeing with Sulphon Cyanine Black B:—the sericin from the silk, the pH of the dye bath during the dyeing operation, and the *temperature*.

For the dyer, we would suggest a modification of the usual method for single bath dyeing similar to that suggested by Daniel[5]. The temperature effect is more pronounced at higher pH. During the degumming process, as the sericin comes out of the silk, the pH is lowered approximately 0.5 pH to an optimum quantity which gives satisfactory degumming, but does not so rapidly destroy the dye. We would also suggest, then, that at first the degumming agent only be added to the goods in the dyeing machine, and that this be run at maximum temperature for about 20 minutes, which should get out a large proportion of the sericin. At the end of this time, the dye should be added, and the temperature throughout the bath be lowered. In many machines this can be done simply by running the machine open; in some cases it may be necessary to blow air through the bath to cool it sufficiently and to correctly control the temperature. After the dye is added, closer attention must be paid to the temperature of the bath, so that high temperatures are avoided. Too low a temperature, of course, will result in less penetration of the dye into the fiber. To obtain more successful dyeings, degum first at high temperature, then add dye and drop to a slightly lower temperature, avoiding any condition which will cause excess local heat in any part of the bath.

The more obvious remedy, of course, is to use this dye only with a two bath method. For success with it, the gum must be thoroughly removed from the silk. If this is done, then the temperature effect, as has been noted, should not be experienced. The split bath method offers the advantage of removing some of the sericin, but enough is left in the fiber to offer the possibility of trouble, although not as much as in the single bath method. But in any event, after the gum is removed, and the bath has attained the optimum pH of around 9.0-9.4, the temperature must not be allowed to go too high.

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CALENDAR OF COMING EVENTS

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MEETING, PHILADELPHIA SECTION, FRIDAY, MARCH 8th, BROADWOOD HOTEL, PHILADELPHIA.

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MEETING, NEW YORK SECTION, FRIDAY, MARCH 1st, ALEXANDER HAMILTON HOTEL, PATERSON, N. J.

AMERICAN
DYESTUFF
REPORTER

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● STATISTICAL STATEMENTS

The Commerce Department's Chemical Division will continue the publication of import and export statements in 1935, according to advices just received from C. C. Concannon, who heads that department of Bureau of Foreign and Domestic Commerce activities.

These statements, most of which have been published for years, cover the whole range of trade in chemicals and allied products, including medicinals, toiletries, drugs, coal-tar products, perfumeries, matches, heavy chemicals and chemical specialties, paint products, naval stores and fertilizers. Imports and exports of each item are given both in quantity and value together with the country of origin and destination.

Judging from the wide acceptance of these statements the industry evidently finds the data of value.

Mr. Concannon states he will be pleased to forward a catalog describing each statement in detail. Requests should be addressed to the Commerce Department, Washington, D. C., and marked for attention of "Chemical Division."

● TEXTILE EXPOSITION

Textile students of North Carolina State College have elected Hugh D. Whitener, an honor student, superintendent of their 16th Annual Textile Exposition which will be held during the latter part of April. Election to this office is the highest honor which Textile students can bestow upon a member of the Senior class.

Other students honored by election as officers of the 1935 Textile Exposition are as follows: assistant superintendent, George B. Peeler, Shelby, N. C.; foreman of yarn manufacture, R. L. Poovey, Statesville, N. C.; assistant foreman of yarn manufacture, R. C. Going, Fieldale, Va.; foreman of weaving, D. A. Brannon, Rockingham, N. C.; assistant foreman of weaving, R. L. Rogers, Oakboro, N. C.; foreman of designing, K. W. Horne, Mount Gilead, N. C.; assistant foreman of designing, J. D. Moore, North Wilkesboro, N. C.; foreman of knitting, M. M. Tuttle, Jr., Monroe, N. C.; assistant foreman of knitting, J. A. Boland, Burlington, N. C.; foreman of dyeing, J. J. Griffith, Jr., Kernersville, N. C.; assistant foreman of dyeing, W. F. Gaston, Belmont, N. C.

● FEBRUARY TEXTILE RESEARCH

The February number of *Textile Research,* published by U. S. Institute for Textile Research, Inc., contains reports of studies of interest to the cotton, wool and silk industries. "A Critical Study of Cotton Manufacturing Processes" is the concluding report of a series of researches conducted by R. L. Lee, Jr., at Lowell (Mass.) Textile Institute for the Textile Foundation. It shows, among other results, that the product of the first drawing process is less irregular than that of any other machine; and also that there is no significant difference in irregularity between yarns produced by regular-draft and long-draft systems, except in one of the cases studied where the long-draft yarns were most irregular.

Dr. J. I. Hardy describes an improved technique for determining fiber fineness and cross-sectional variability, which is applicable to all fibers. It was developed by Dr. Hardy for wool measurements, and its application for obtaining photomicrographs by projecting cross-sections of wool fibers on sensitized paper is described and illustrated.

Prof. O. A. Hougen, director of laboratories, United States Testing Co., Inc., completes in this issue a series of reports on "Silk Degumming" researches that were conducted at the University of Wisconsin and the plant of the Holeproof Hosiery Co., Milwaukee, Wisc. The Textile Foundation has financed their publication. As a result of this study a fundamental equation has been built up formulating the method of boiling-off silk hosiery, and degumming coefficients have been experimentally determined and numerically related to all of the variables of operation.

It is stated editorially that only a half dozen more cooperators are needed to complete the financing of the $10,000 warp sizing research, to be conducted under the auspices of U. S. Institute for Textile Research with the aid of the Textile Foundation. The abstract section of this issue, covering textile research throughout the world, contains reference to several recent sizing studies.

Washington News Letter

By **WALDON FAWCETT**

SOME of the lesser wheels in the rebuilt Governmental administrative machine have contacts with commerce and industry far out of proportion to the publicity they have received. A case in point is the Marketing Research and Service Division of the Bureau of Foreign and Domestic Commerce. This new unit is a consolidation of a number of erstwhile separate agencies in the field of domestic commerce. Among the supplanted subdivisions were the Division of Merchandising Research, the Marketing Service, and a group of Domestic Regional Divisions. Compacting the most valuable functions of the group the new set-up affords a single, centralized reservoir of business information, cost data, and facts in trade practices. Together with a central office for assemblage of trade-association information and for market-research activities. This recast Division is, by the by, the branch of the Commerce organization which is probing the problem of "returned goods,"—a practice that is not without its implications for the textile-dyestuffs community. Markdowns,—their causes and control, is another major objective in the current program of exploration.

PROGRESS IN COLOR INVESTIGATIONS

The year which recently closed witnessed further progress of the investigations by the U. S. Bureau of Chemistry of fast dyes for agricultural fibers. In justification of continued effort in this direction, the officials claim the Bureau's work on the methods of preparation of the intermediates used in the manufacture of dyes, especially those for use on cotton, have resulted in improvements which are accomplishing savings of $75,000 annually. And are thereby enabling the industry to better meet the competition of imported dyes, while, at the same time, so lowering the prices of the domestic product as to permit greater utilization on cotton goods.

To the same end of ultimate economic advantage, the Chemistry Bureau staff is continuing its effort to extend the use of iron reactors as substitutes for the usual enamel- or lead-lined apparatus used in the manufacture of vat-dye intermediates. Confidence is expressed that the substitution of the cheaper apparatus in the industry, as a result of the discoveries made this past year or two, will make possible further savings in the costs of manufacture.

Turning to another aspect of the current program of work at the Bureau of Chemistry, it may be worth mention that one of the chemists of this Division of the Department of Agriculture has been assigned to Hawaii to experiment in application of the Bureau's method for the production of high-grade cellulose from sugar-cane bagasse by the nitric acid-pulping process. It is predicted that the adoption of this process will lead to the establishment of sugar-cane bagasse as an important source for high-grade cellulose.

U. S. TEXTILE DIVISION NURSES COOPERATION

No branch of the Federal Government has gone so far as the Commerce Department's Textile Division in demonstration of the possibilities of cooperation as between the Departments at Washington and the agencies of organized industry. A prime example of concerted effort is afforded by the campaign, under the leadership of the Textile Division, to stimulate domestic production of flax and bring about the utilization of the flax output for fabric manufacture. Textile schools and several textile laboratories are included in the circle of cooperators. Another object lesson in the pyramiding of research resources is afforded by the Study of the Production and Marketing of Silk and Rayon Goods. Here was an undertaking which enlisted team play by the U. S. Textile Division, the National Federation of Textiles, the Textile Foundation, and Harvard University.

WEATHER - AND FIREPROOFING FARM FABRICS

For no unsolved technical problem does Uncle Sam manifest deeper concern than that which concerns "preservation treatments" for fabrics. As guardian and mentor of rural industry, the U. S. Department of Agriculture is keen to provide impervious or resistant fabrics or covers which may be relied upon to protect farm tools and crops from the elements, and other destructive forces. Proportionately, the Department has been disappointed by the slow and restricted progress which has been made industrially in the development of inexpensive weather-resistant fireproofing treatments for fabrics used out of doors. In speeding up, recently, this line of research and experiment, the Department was, moreover, actuated by a double purpose. On top of the need for low-price, dependable farm covers is the desire to find a new or enlarged use for cotton fabrics.

In the estimation of the Federal specialists the most encouraging step forward is to be found in the recent development of the new glow-proofing chlorinated resin,

designed especially for use in the fireproofing of cotton. There is promise of fulfillment of farm needs in the circumstance that this agent is cheap and effective and possesses good waterproofing properties.

With an eye to placing the new asset on a quantity production basis forthwith, the new and complete fireproofing process, which was worked out with the well-known Perkin process as a starting point, is being developed commercially—with the Government specialists participating in advisory capacities. That the initiative of the Department in this responsibility has been considerable is attested by the fact that the improvements in processing which have been devised are the basis for three applications for patents which, if and when issued, will be dedicated to the public.

New features of the process which have revolutionary influence, include the mutual reaction of sodium stannate and heavy metal salts resulting in the precipitation of cheaper metallic oxides with tin oxide, an additional step for increasing the quantity of colored oxide to protect the fabric against deterioration by sunlight, and, finally, a coating with the new glow-proofing resin, which is, in reality, a flame-proofing agent as well.

STANDARDS STAFF ABSORBED BY ROUTINE

It has only needed the situation which has existed this past year or two to emphasize the dominance of the commodity verification responsibilities of the National Bureau of Standards. The Act of Congress whereby the Standards institution was founded provides for tests without charge, at the call of the National and State Governments. The great volume of this work, particularly the testing of supplies for the Federal Government has, in recent months, taxed the Bureau's resources to the limit. This load, combined with the limited allotments of funds now available, has made it necessary this past year to abandon or further curtail the research work in order to carry out the check-ups on Government purchases.

Thanks to the willingness of industry, in certain instances, to bear a generous share of the expense, a skeleton program of investigational work has survived. An outstanding example is the results of the alliance with the American Association of Textile Chemists and Colorists and with the Textile Foundation. It was in connection with this tri-party study of wool textiles that there was developed the new method for determining the action of various chemicals upon wool. Another project which has survived the blight is the cooperation with the National Association of Hosiery Manufacturers, the fruit of which has been the development of standards for hosiery,—an achievement in authoritative specification which might not have been possible without the aid of the testing machine developed and designed by the Bureau. Negotiation of commercial standards goes on, despite the cramped program at the National Bureau. Among the classes of products now in line for quality standardization may be cited bathing suits, sweaters, berets, and wool blankets (supplementary). It is a commentary upon the spirit of industry that despite the derangements at the National Bureau of Standards there remain at work there a total of more than fifty Research Associates supported in their technical research by national engineering and chemical societies or by trade associations.

FOOD COLOR PRODUCTION BACK TO NORMAL

The most interesting revelation in the 1934 statistics covering Federal certification of coal-tar colors consists in the disclosure that the production of food colors is back approximately to the normal of the pre-depression period. The output of this class of dyes showed a noticeable slump during the business recession, the falling-off being most marked during the year 1932-33. Figures for the twelve months covered by the latest computation indicate a return to the production level of 1926 to 1931.

Examination, in compliance with the certification system of the U. S. Food and Drug Administration, encompassed, last year, 1,338 batches of food colors representing the output of 37 firms. Straight dyes, not including repacked colors, amounted to 290,278 pounds. Certification also covered 21,116 pounds of repacked straight dyes and 354,129 pounds of mixtures. To enable comparison it may be recalled that during the previous year a total quantity of 181,486 pounds of straight dyes were certified under foundation certificates. The repacked straight dyes footed up, in that period 15,230 pounds; the mixtures totaled 333,675 pounds.

That the output of mixtures has not shown the upward bound noticeable in the other classifications is only logical because at the time that the straight dyes and repacked straight dyes showed the sharpest slump, the amount of mixtures certified showed no great decrease. In the opinion of Mr. H. T. Herrick, principal chemist in charge of the Color Certification Laboratory, this was probably accounted for by the fact that it is possible to keep the weight of a mixture the same, while cutting down on the actual amount of dye used, by means of diluents. Another fact which must be borne in mind when studying the food color statistics to gauge the extent of the rebound, is that when the total poundage of colors certified fell to the low point there was not a proportionate reduction in the number of batches examined. The seeming contradiction is explained by the fact that at that stage the batches were smaller. Incidentally that realignment left the Color Laboratory with as much work to do in the subnormal period as in the equivalent normal interval, it being no more difficult to analyze a sample from a large batch than from a smaller one.

The comparative record of rejections is not without interest in the parallel of the two spans. Year before last there were examined and rejected nine batches of straight dyes, three batches of repacked straight dyes and eleven batches of mixtures. Last year refusals of certification were imposed upon thirteen batches of straight dyes and

six batches, each, of repacked straight dyes and mixtures.

Students of trends in this branch of the dyestuffs industry may be interested to observe the shifts in the relative quantities of the different colors of straight dyes certified. Orange I which comprised nearly 33½ per cent of the poundage of all colors year before last slipped last year to about 30½ per cent. Meanwhile, Tartrazine advanced from a little over 22 per cent to 24.45 per cent. Amaranth shot up to 20.41 per cent of the total from a previous quota of 14.95 per cent. Meanwhile, Ponceau 3R showed a slight loss in proportion as did Yellow OB. Light Green SF Yellowish was back this past year in the list of participating colors after having disappeared from the score card the year before. That defection (for the first time since Light Green SF Yellowish was placed on the original list of permitted colors in 1907) was attributed at the time to the increased use of Fast Green FCF and Brilliant Blue FCF. Both these two last mentioned colors continued to gain sharply last year, in terms both of poundage and percentage of the total but apparently this increase did not operate as in the previous year to crowd out the Light Green SF Yellowish.

The 1934 inventory shows no new dyes added nor no colors dropped from the permitted list. A certain amount of research on methods of analysis continues to be carried on at the Color Certification Laboratory,—explorative work well typified as to character by the working out of the new method for the determination of acid extractives in Yellow OB and Yellow AB,—methods that are tested simultaneously in several commercial laboratories.

● LABORATORY OF TOXICOLOGY

E. I. du Pont de Nemours & Company dedicated and opened on January 22, its new medical research laboratory to be known as the Haskell Laboratory of Industrial Toxicology, the purpose of which will be to test thoroughly, from a health standpoint, all products produced by the company before they are placed on the market. The laboratory was planned to meet a need which has developed in this country because of the great growth of the chemical industry as represented by du Pont. A function of the laboratory will also be to study the possible effects of new products upon the health of employes during the process of manufacture.

The importance of the analyses and studies to be made will readily be understood by that large group of manufacturers who use du Pont products as raw materials in their business. It will mean that before new products are produced on a large scale and put on the market, they will be given the most thorough examination and the most exhaustive study in regard to any potential danger which might exist, either on other industries during the process of manufacture or the effects on general consumers who may buy them from manufacturers. It is said that its staff will be the largest and its equipment the most extensive of any laboratory in the world.

● BERMAN HONORED

Victor H. Berman, president of the Onyx Oil & Chemical Co., Jersey City, N. J., was signally honored by Governor Harold G. Hoffman, of New Jersey, from whom he received an appointment to serve with former Governor Alfred E. Smith of New York, as a member of the Palisades Interstate Park Commission. Mr. Berman's deep interest and wide activity in many civic affairs, and his unusual executive and organizing abilities, partcularly fit him for this high position.

In addition to his many duties as president of the Onyx company, his cooperative work with dyers and finishers, and his work as a member of the Executive Board of the code authority of the Sulfonated Oil Manufacturers, Mr. Berman finds time for numerous outside activities. These include welfare work for the underprivileged children; directorships in a saving bank, hospital and tuberculosis league; member of the advisory board of the American Red Cross; member of the Masonic order and Jersey City Elks; past president of the Jersey City Kiwanis and still a very active member in that group.

CLASSIFIED

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

POSITION WANTED—Dyer age 30, married, ten years experience dyeing cotton skeins and sewing thread with direct, basic, developed, vat and naphtol colors. Write Box No. 848, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

MAJOR MANUFACTURER of a complete line of Sulfonated Oil Specialties, Waterproofing, Splashproofing, Finishing and Degumming agents for full fashioned hosiery mills; Rayon Throwing Oils, Rayon Sizes, Soluble Waxes and Tallow Softeners, has position open in southern territory for capable representative with successful 1932-1933-1934 selling record. This type of man is probably now employed, or has sound reasons for not being connected. If you think you are qualified to fill this position, write us fully why you think so, giving complete business experience for the past ten years, references, age, etc. All applications will be treated in strict confidence. Write Box No. 849, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.